# EXHIBIT A

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Patent Application**

Applicant(s): M.A.K. Alicherry et al.
Case: 17-3-19-12-35
Serial No.: 11/169,194
Filing Date: June 28, 2005
Group: 2416
Examiner: Abdulla A. Riyami

Title: Multi-Path Routing Using Intra-Flow Splitting

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AMENDMENT SUBMITTED WITH FILING OF RCE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Advisory Action dated April 7, 2009, Applicants submit herewith a Request for Continued Examination and respectfully request withdrawal of the finality of the Office Action dated December 31, 2008, in accordance with 37 CFR 1.114(d). Applicants also request reconsideration of the above-identified application in view of the amendment and remarks herein.

IN THE CLAIMS

1. (Currently amended) A method of processing traffic flows at a node in a network, comprising the steps of:

obtaining by the node a plurality of traffic flows, each of the traffic flows comprising multiple packets or bytes;

splitting by the node each of the plurality of traffic flows into at least two sub-flows, wherein each of the at least two sub-flows comprises a portion of the multiple packets or bytes from its respective traffic flow; and

routing by the node the packets or bytes of the at least two sub-flows respectively on at least two paths in the network;

wherein the routing step further comprises combining at least one of the sub-flows of each of at least two of the plurality of traffic flows and routing the combined packets or bytes on one of the paths;

wherein each traffic flow between the node and a given destination node is split based on a split ratio vector into a plurality of sub-flows corresponding to respective ones of a plurality of paths between the node and the given destination node, and further wherein the split ratio vector is configured such that the portion of the multiple packets or bytes assigned to each of the plurality of sub-flows is substantially proportional to a mean traffic rate of the respective corresponding path.

2. (Canceled)

3. (Previously presented) The method of claim 1, wherein the routing step further comprises combining others of the sub-flows of at least a portion of the plurality of traffic flows and routing the combined packets or bytes on another of the paths.

4. (Canceled)

5. (Previously presented) The method of claim 1, wherein the splitting of the plurality of flows into at least two sub-flows and routing the packets or bytes of the at least two sub-flows respectively on at least two paths in the network reduces a variance associated with at least one of the traffic flows.

6. (Previously presented) The method of claim 5, wherein the splitting of the flows into at least two sub-flows and routing the packets or bytes of the at least two sub-flows respectively on at least two paths in the network reduces a loss probability associated with at least one of the traffic flows.

7. (Original) The method of claim 6, wherein the loss probability is $d^r$, where $d$ is the loss probability of flow-based splitting and $r$ is the reduction in variance for intra-flow splitting.

8. (Original) The method of claim 6, wherein the reduction is realizable at a network design time or a provisioning time.

9. (Previously presented) The method of claim 3, wherein the splitting of the traffic flows into sub-flows, combining ones of the sub-flows, combining others of the sub-flows, and routing the packets or bytes of the combined sub-flows on at least two paths in the network reduces a bandwidth requirement associated with the traffic flows.

10. (Original) The method of claim 9, wherein a variable bandwidth is reduced by a factor of $r^{\frac{1}{2H}}$, where $r$ is a variance reduction factor and $H$ is a Hurst parameter.

11. (Original) The method of claim 9, wherein the reduction is realizable at a network design time or a provisioning time.

12. (Previously presented) The method of claim 1, wherein at least one of the traffic flows comprises a long range dependent traffic flow or a short range dependent traffic flow.

13. (Currently amended) Apparatus for processing traffic flows at a node of a network, comprising:

a memory; and

a processor coupled to the memory and operative to: (i) obtain a plurality of traffic flows, each of the plurality of traffic flows comprising multiple packets or bytes; (ii) split each of the plurality of traffic flows into at least two sub-flows based on a split ratio vector, wherein each of the at least two sub-flows comprises a portion of the multiple packets or bytes from its respective traffic flow; and (iii) route the packets or bytes of the at least two sub-flows respectively on at least two paths in the network;

wherein the routing operation further comprises combining at least one of the sub-flows of each of at least two of the plurality of traffic flows and routing the combined packets or bytes on one of the paths;

wherein each traffic flow between the node and a given destination node is split based on a split ratio vector into a plurality of sub-flows corresponding to respective ones of a plurality of paths between the node and the given destination node, and further wherein the split ratio vector is configured such that the portion of the multiple packets or bytes assigned to each of the plurality of sub-flows is substantially proportional to a mean traffic rate of the respective corresponding path.

14. (Canceled)

15. (Previously presented) The apparatus of claim 13, wherein the routing operation further comprises combining others of the sub-flows of at least a portion of the plurality of traffic flows and routing the combined packets or bytes on another of the paths.

16. (Canceled)

17. (Previously presented) The apparatus of claim 13, wherein the splitting of the plurality of flows into at least two sub-flows and routing the packets or bytes of the at least two sub-flows respectively on at least two paths in the network reduces a variance associated with at least one of the traffic flows.

18. (Previously presented) The apparatus of claim 15, wherein the splitting of the traffic flows into sub-flows, combining ones of the sub-flows, combining others of the sub-flows, and routing the packets or bytes of the combined sub-flows on at least two paths in the network reduces a bandwidth requirement associated with the traffic flows.

19. (Previously presented) The apparatus of claim 13, wherein at least one of the traffic flows comprises a long range dependent traffic flow or a short range dependent traffic flow.

20. (Currently amended) A multi-path routing-capable node of a mesh-type network, comprising:

a memory; and

a processor coupled to the memory and operative to: (i) obtain a plurality of traffic flows, each of the traffic flows comprising multiple packets or bytes; (ii) split each of the plurality of flows into at least two sub-flows based on a split ratio vector, wherein each of the sub-flows comprises a portion of the multiple packets or bytes from its respective traffic flow; and (iii) combining ones of the sub-flows of each of the plurality of traffic flows and routing the combined packets or bytes on one path of the mesh-type network, and combining others of the sub-flows of each of the at least two traffic flows and routing the combined packets or bytes on another path of the mesh-type network, such that at least one of the sub-flows of each of at least two of the plurality of traffic flows are combined and routed on a given path of the mesh-type network;

wherein each traffic flow between the node and a given destination node is split based on a split ratio vector into a plurality of sub-flows corresponding to respective ones of a plurality of paths

between the node and the given destination node, and further wherein the split ratio vector is configured such that the portion of the multiple packets or bytes assigned to each of the plurality of sub-flows is substantially proportional to a mean traffic rate of the respective corresponding path.

REMARKS

The present application was filed on June 28, 2005 with claims 1-20. Claims 2 and 14 were canceled in a previous amendment and claims 1, 3-13 and 15-20 were pending prior to the present amendment. Claims 1, 13 and 20 are the independent claims.

Claims 1 and 3-12 are rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter.

Claims 1, 3, 9, 13, 15, 18 and 20 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application Publication No. 2005/0286487 (hereinafter "Chitrapu") in view of U.S. Patent Application Publication No. 2006/0050736 (hereinafter "Segel").

Claims 4-8, 10-12, 16, 17 and 19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Chitrapu and Segel in view of an article by Cetinkaya et al., entitled "Opportunistic Traffic Scheduling Over Multiple Network Paths," (hereinafter "Cetinkaya").

As an initial matter, the undersigned attorney thanks the Examiner for the courtesies extended during telephone interviews on April 30, 2009, and May 29, 2009. Based on this discussion, the amendments proposed herein are believed to overcome the present §101 rejection, as well as the present §103 rejections over Chitrapu, Segel and Cetinkaya.

With regard to the §101 rejection, Applicants respectfully traverse on the grounds discussed in Applicants' previous response filed on March 31, 2009. Specifically, Applicants respectfully maintain that independent claim 1, as previously presented, satisfied at least the "machine" branch of the "machine-or-transformation" test. Notwithstanding this traversal, Applicants have amended claim 1 without prejudice solely in order to conform to the Examiner's subjective preference that claim 1 should "tie to another statutory class (such as a particular apparatus) by identifying the apparatus that accomplishes the method steps," as discussed in the Office Action at page 3, third paragraph. More particularly, Applicants have amended claim 1 as amended recites that the obtaining, splitting, and routing steps are each performed by the node of the network. Support for the present amendment may be found in the specification at, for example, page 20, lines 9-15.

With regard to the §103 rejection, Applicants have amended independent claims 1, 13 and 20 without prejudice solely to expedite allowance by clarifying the claimed subject matter. More particularly, these claims have been amended to incorporate the subject matter recited in dependent claims 4 and 16, and thus to specify that each of the plurality of traffic flows is split into at least two sub-flows based on a split ratio vector. Applicants believe that this amendment alone is sufficient to overcome the present §103 rejections over Chitrapu, Segel and Cetinkaya, for at least the reasons discussed in Applicants' previous response filed March 31, 2009. For example, Applicants respectfully submit that the proposed modification of Segel so as to incorporate the path weights taught by Cetinkaya would change the principle of operation of Segel, as discussed in the Abstract thereof, and that Segel in fact teaches away from any such that any such modification.

Notwithstanding the foregoing, Applicants have further amended the independent claims in the manner suggested by the Examiner in the aforementioned telephone interviews. In view of the foregoing traversals, Applicants are not making these further amendments for reasons relating to unpatentability over the cited references. Rather, these amendments are being made solely in order to expedite allowance of the present application.

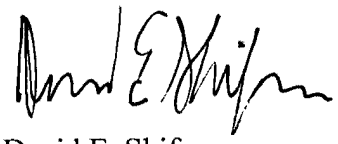
Specifically, Applicants have included additional limitations directed to the subject matter recited in the specification at page 13, lines 1-9. Further support for this amendment may be found in the specification at, for example, page 5, lines 4-8. Applicants respectfully submit that, as discussed in the telephone interview, these amendments are believed to place the application in condition for allowance, or at least in better form for further consideration.

The independent claims now recite additional limitations wherein each traffic flow between the node and a given destination node is split based on a split ratio vector into a plurality of sub-flows corresponding to respective ones of a plurality of paths between the node and the given destination node, and wherein the split ratio vector is configured such that the portion of the multiple packets or bytes assigned to each of the plurality of sub-flows is substantially proportional to a mean traffic rate of the respective corresponding paths.

It should be noted that Applicants have determined that illustrative embodiments which meet these newly-added limitations offer a number of advantages over conventional arrangements. See the specification at, for example, page 13, lines 10-15, and page 14, lines 14-19.

In view of the above, Applicants believe that amended claims 1, 3, 5-13, 15 and 17-20 are in condition for allowance, and respectfully request withdrawal of the §101 and §103 rejections.

Respectfully submitted,



Date: June 1, 2009

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